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Uhl et al.

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[54] **CUTTER HEAD WITH COVER FOR DRIVE PINION**

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[22] Filed: **Dec. 2, 1998**

[30] **Foreign Application Priority Data**

Dec. 2, 1997 [DE] Germany 197 53 360

[51] **Int. Cl.**[7] **B27B 17/00**

[52] **U.S. Cl.** **30/383**; 30/381

[58] **Field of Search** 30/122, 381–387

[56] **References Cited**

U.S. PATENT DOCUMENTS

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Primary Examiner—Douglas D Watts

Attorney, Agent, or Firm—Robert W. Becker & Associates

[57] **ABSTRACT**

A cutter head assembly for a motor chain saw has a cutter head housing and a drive shaft mounted in and projecting from the cutter head housing. A drive pinion is mounted on the portion of the drive shaft projecting from the cutter head housing. A guide bar having a first end positioned adjacent to the drive pinion is provided. A saw chain is driven by the drive pinion and circulates on the guide bar. A cover covering the drive pinion and resting at least in an area of outgoing deflection of the saw chain at a housing wall of the cutter head housing defines a cuttings chamber open toward the guide bar. The first end of the guide bar is clamped between the housing wall of the cutter head housing end the cover. The cover has a cuttings ejection opening opposite the housing wall in the vicinity of the area of outgoing deflection. The cuttings ejection opening has a rim extending in a circulating direction of the saw chain and a ramp projecting from a first portion of the rim into the cutting chamber.

15 Claims, 5 Drawing Sheets

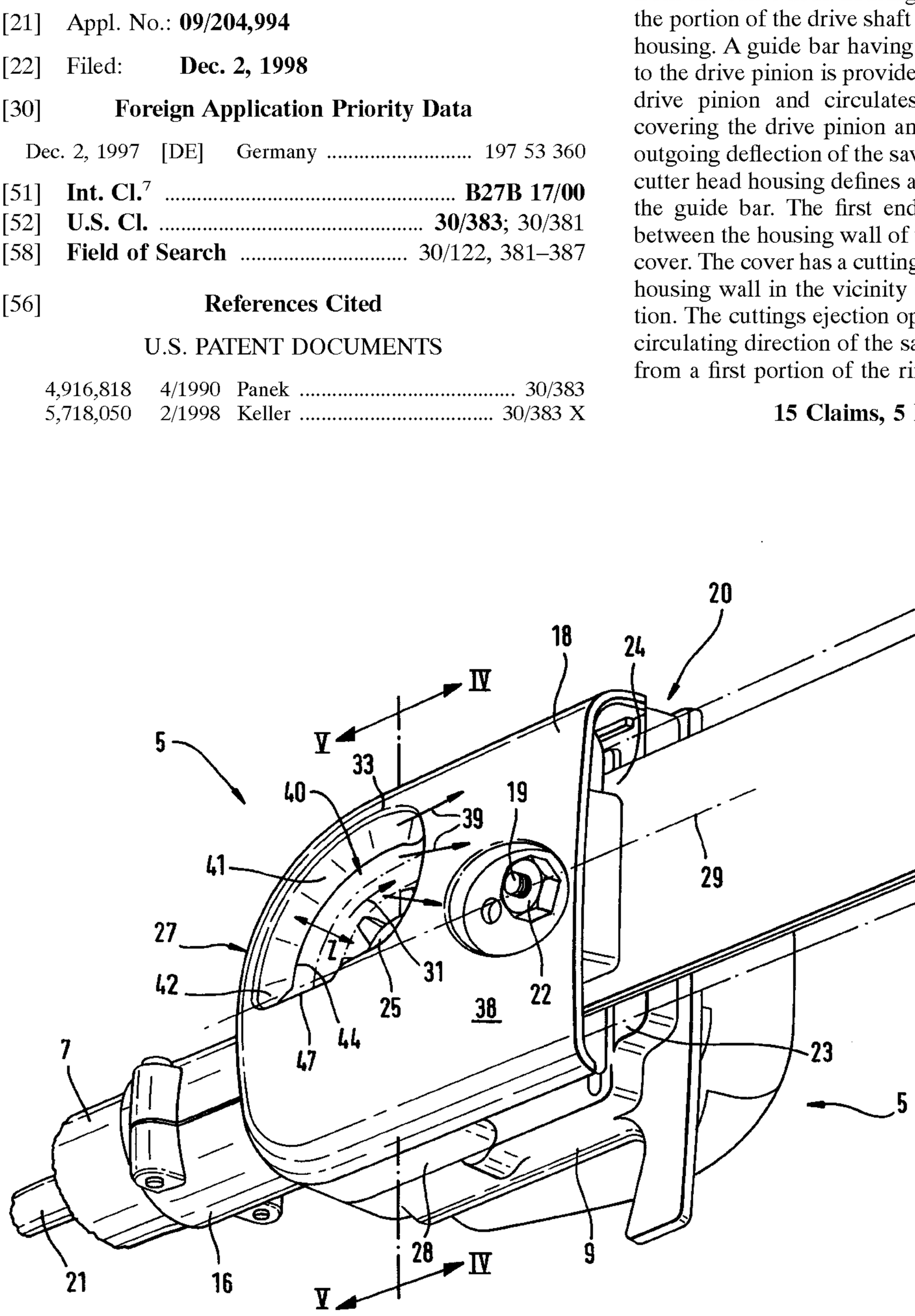
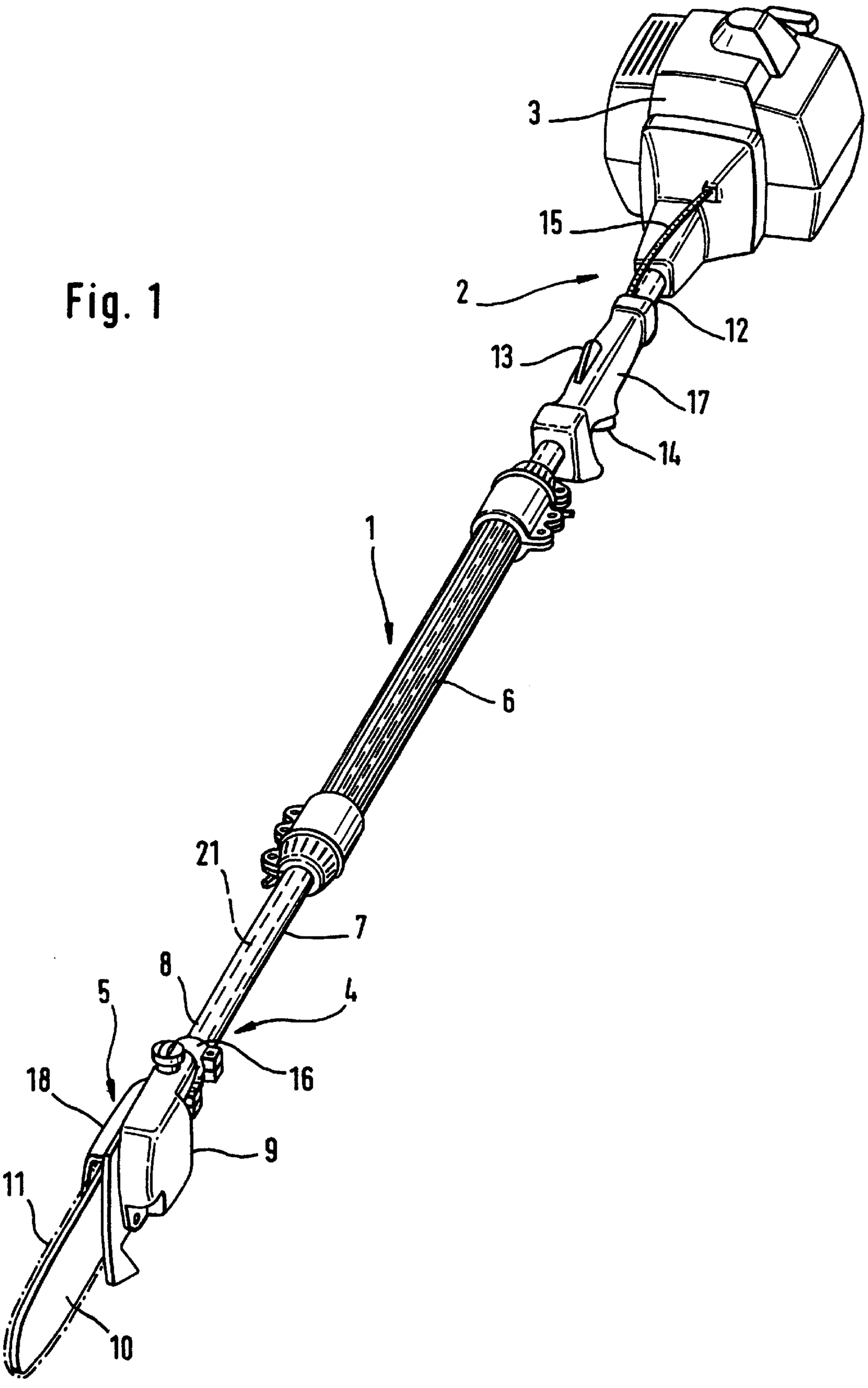


Fig. 1



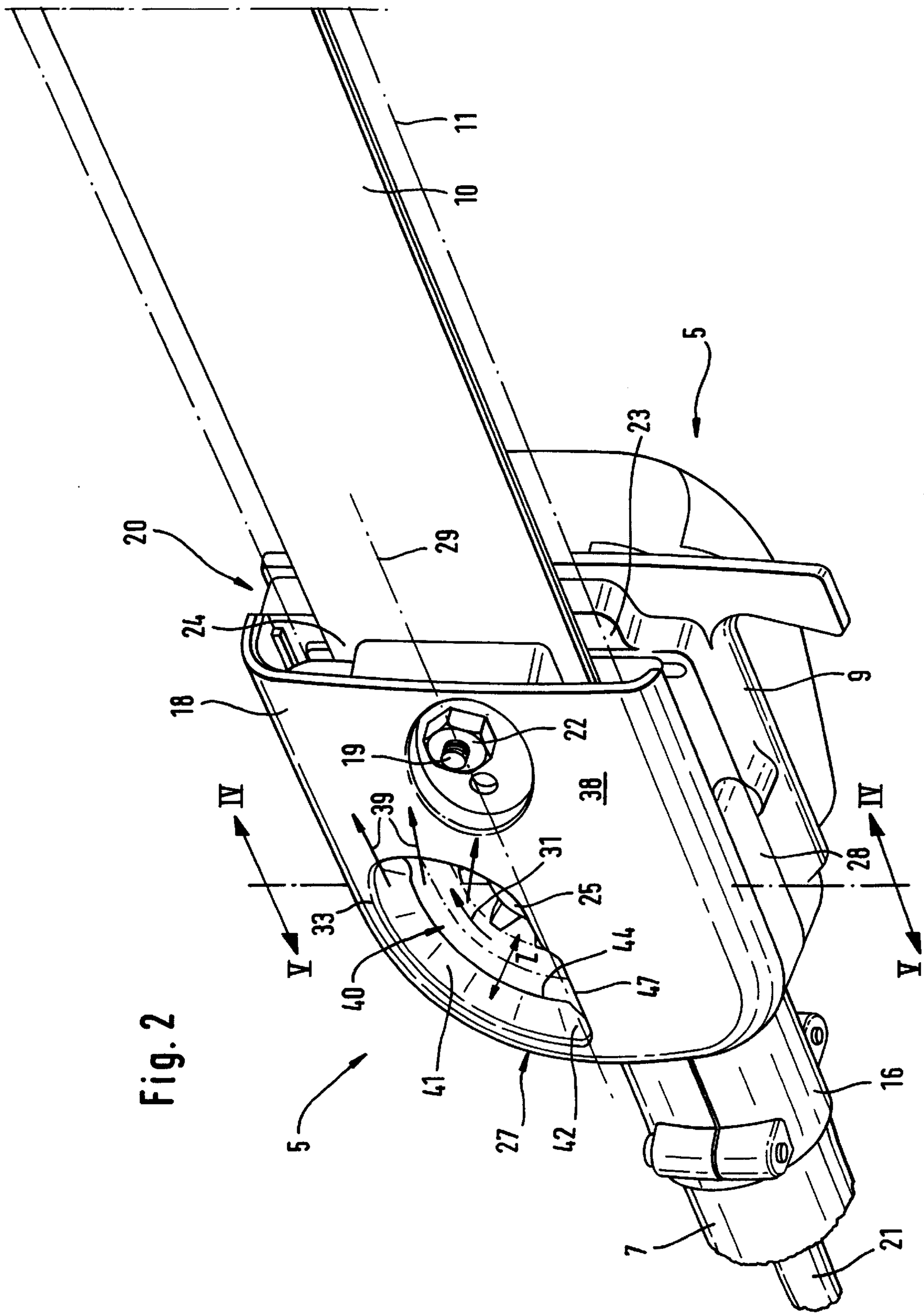

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Fig. 2

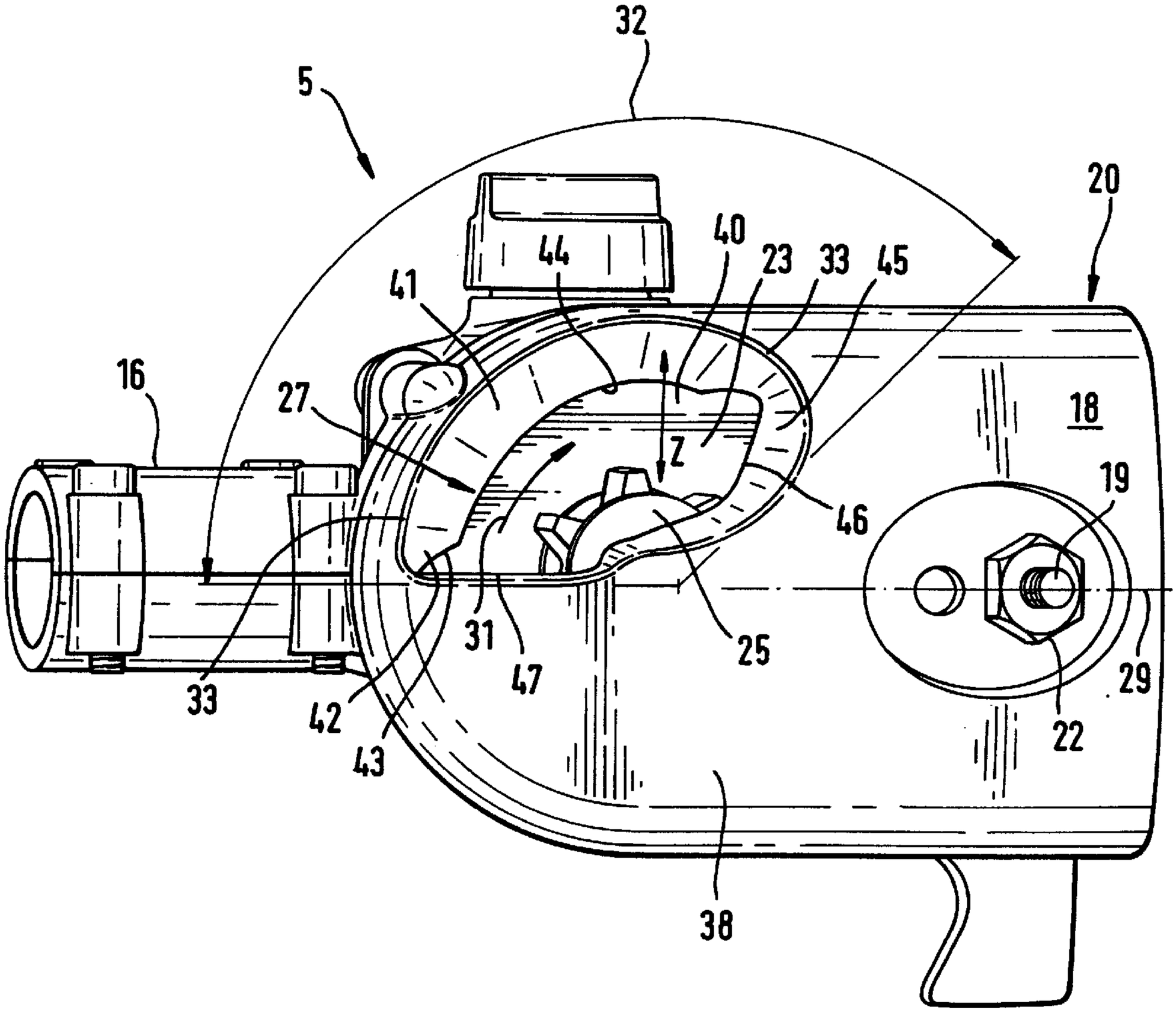

Fig. 3

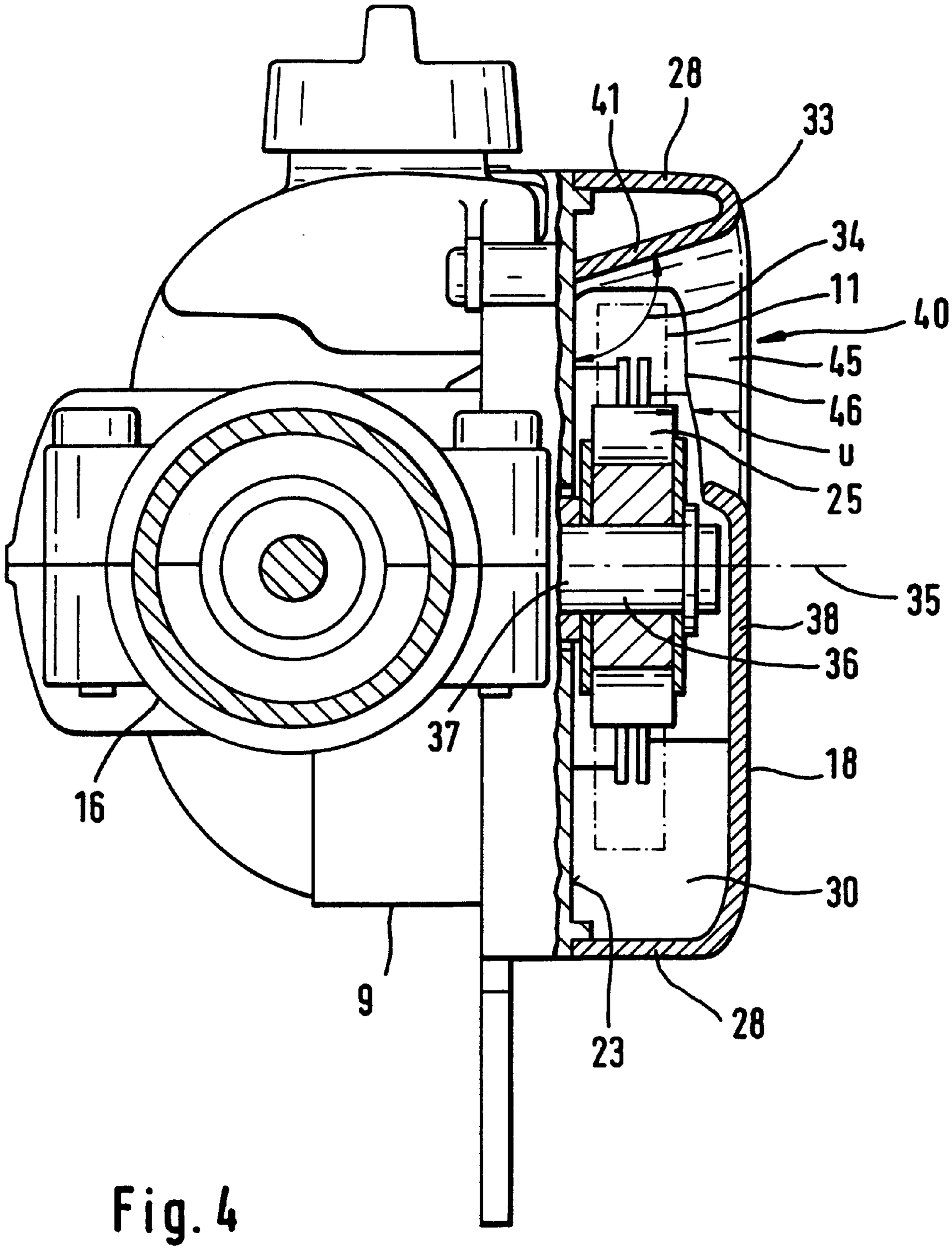

Fig. 4

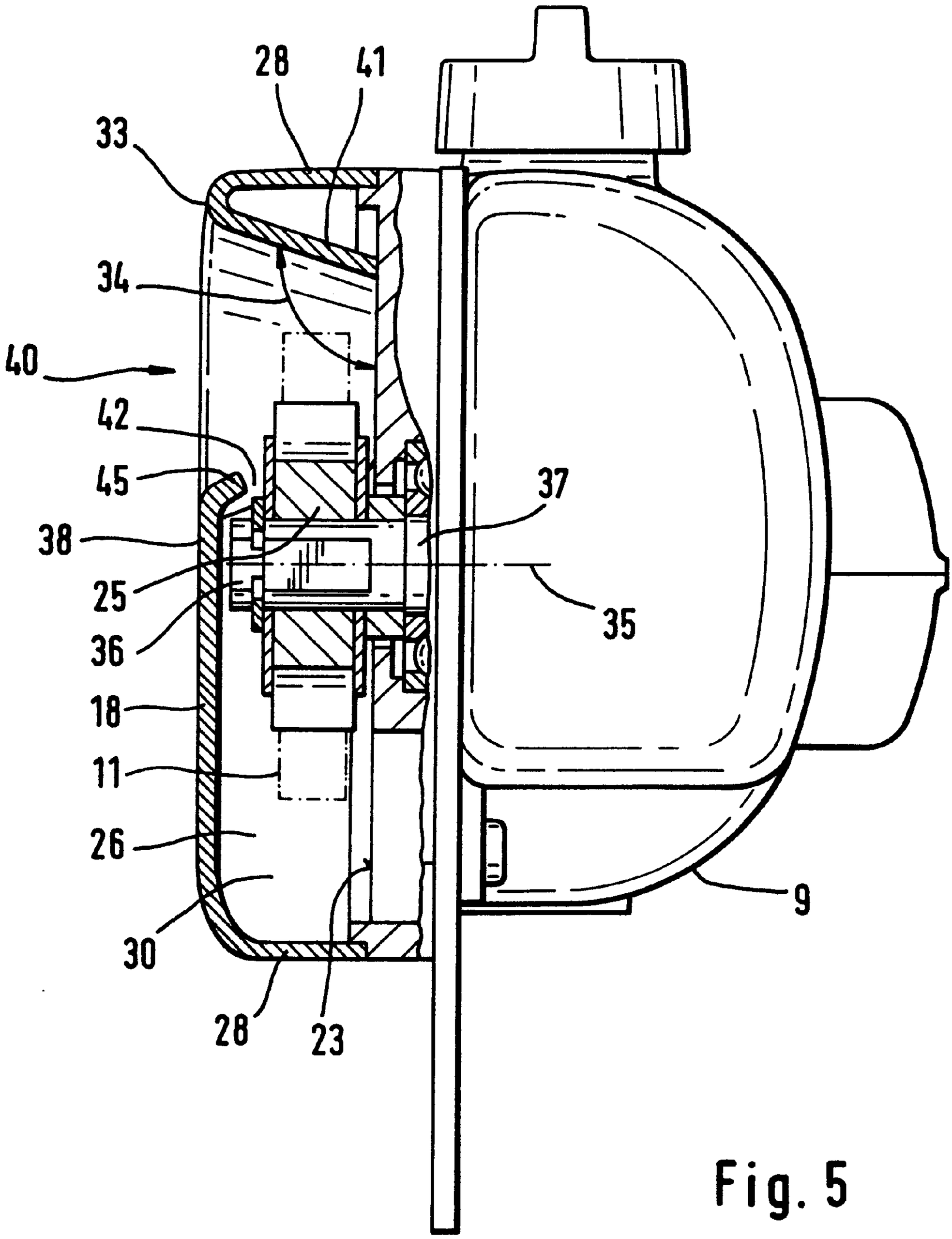

Fig. 5

CUTTER HEAD WITH COVER FOR DRIVE PINION

BACKGROUND OF THE INVENTION

The present invention relates to a cutter head for a motor chainsaw, especially for a tree pruner, wherein the saw chain guided on a guide bar is driven by a drive pinion which is secured onto a portion of a drive shaft projecting from the housing. The guide bar is clamped between a housing side of the housing and a cover for the drive pinion. The cover rests at least over the area of outgoing deflection of the saw chain at the facing housing wall of the housing and thus delimits a cuttings chamber that is substantially open toward the guide bar.

Such cutter heads or cutter head assemblies are known. The saw chain driven by the drive pinion circulates on the guide bar which is clamped between an abutment surface of the housing and the drive pinion cover. The drive pinion cover encloses the pinion and rests with its circumferential rim at areas of the deflection portion of the saw chain at the facing housing wall so that a cuttings chamber is defined which is substantially open in a direction toward the guide bar. The circumferential rim is shortened at the underside of the housing so that wood cuttings that are entrained by the saw chain into the cuttings chamber can fall out under the force of gravity.

When working with motor chain saws in an overhead position, especially in connection with tree pruners, the ejection of wood cuttings at the underside of the cover facing the operator, is impractical because the operator would be subjected to a spray of cuttings which would impede working with the device.

It is therefore an object of the present invention to improve a cutter head of the aforementioned kind and provide it with a cover such that even for over head operation cuttings ejection without impacting the operator can be ensured.

SUMMARY OF THE INVENTION

This object is inventively solved in that the cuttings chamber has a cuttings ejection opening at a lateral surface of the cover opposite of the housing wall in the vicinity of the deflection area of the saw chain. The rim of the opening is provided with a ramp extending in the circulating direction of the saw chain and projecting into the cuttings chamber.

The inventive cuttings ejection opening allows a lateral ejection of cuttings from the cuttings chamber whereby the ramp forces the cuttings onto a laterally forwardly oriented trajectory. The wood cuttings entrained by the saw chain into the cutting chamber are thrown off within the deflection area of the drive pinion, retain substantially their kinetic energy and are then deflected along the ramp into a laterally forwardly directed path. The trajectory defined by the ramp geometry is thus oriented away from the operator so that the operator is not subjected to a spray of cuttings.

In order to favor a trajectory laterally away from the cover, it is expedient to embody the ramp such that in the circulating direction the rearward portion has an increasing slant.

In order to prevent lodging of wood cuttings in the area of the ramp, it is suggested that the inner longitudinal edge of the ramp in the circumferential direction is substantially resting at the housing wall over a large portion of its length.

The cuttings ejection opening is provided over advantageously an angle of 90°, beginning at the longitudinal center

axis of the cover in the circulating direction of the saw chain, whereby the angle is preferably substantially 135°. The cuttings ejection opening, in a plan view onto the cover, with respect to the clockwise direction about the axis of rotation of the drive pinion, can be positioned substantially within the fourth quadrant.

BRIEF DESCRIPTION OF THE DRAWINGS

The object and advantages of the present invention will appear more clearly from the following specification in conjunction with the accompanying drawings, in which;

FIG. **1** is a schematic representation of a tree pruner;

FIG. **2** shows an enlarged representation of a perspective view of the cutter head assembly of the tree pruner of FIG. **1**;

FIG. **3** shows a side view onto the drive pinion cover of the cutter head assembly;

FIG. **4** shows a section of the drive pinion cover along the line IV—IV of FIG. **2**;

FIG. **5** is a section of the drive pinion cover along the line V—V of FIG. **2**.

DESCRIPTION OF PREFERRED EMBODIMENTS

The present invention will now be described in detail with the aid of several specific embodiments utilizing FIGS. **1–5**.

The tree pruner represented as a hand-guided working tool in FIG. **1** serves to remove limbs from trees etc. while the operator is standing on the ground. The tree pruner is comprised of a telescopic rod **1** having at one end **2** a drive motor **3** and at the other end **4** a cutter head **5**. As a drive motor **3** it is expedient to employ an internal combustion engine, for example, a two-stroke engine or a four-stroke engine. It is also possible to employ an electric motor.

The telescopic rod **1** is comprised of an outer tube **6** and an inner tube **7** that can be moved within the outer tube **6**. The free end **8** supports the cutter head **5** which is comprised substantially of the housing **9** with an angular gear box. The input shaft of the angular gear box is connected to the drive shaft **21** supported within the telescopic rod **1** and is driven by the drive motor **3**. The drive motor **3** drives, by the drive shaft **21** and the angular gear box in the housing **9**, a saw chain **11** circulating on the guide bar **10**.

The end of the outer tube **6** facing the drive motor **3** is provided with a connecting tube **12** which supports substantially the operating grip **17** having arranged thereat the gas throttle **14** as well as a gas throttle lock **13**. The gas throttle **14** is connected by a cable pull **15** to a control element for operating the drive motor **3**. The internal combustion engine secured on the connecting tube **12** has a non-represented carburetor having a throttle flap to be actuated by the cable pull **15**.

The cutter head **5** is connected by a connecting clamp **16** to the free end **8** of the inner tube **7**.

As can be seen in FIG. **2**, the cutter head includes a guide bar **10** and a saw chain **11** circulating thereon as well as fasteners **20** for mounting on the housing **9** of the cutter head **5**. The fasteners **20** are comprised substantially of a drive pinion cover **18** being placed onto a fastening bolt **19** connected to the housing and secured by a clamping nut **22** against the housing wall **23** of the housing **9**. One end **24** of the guide bar **10** is clamped between the housing wall **23** of the housing **9** and the pinion cover **18** and is thus fixedly secured at the housing **9** of the cutter head **5**.

The drive pinion cover **18** covers the drive pinion **25** (FIG. **3**) whereby the cover **18** is hood shaped and rests with its sidewalls **26, 28** forming the rim at the facing housing wall **23** of the housing **9**. The sidewalls **2** extend, as in shown in FIG. **2**, not only withing the deflection area **27** of the drive pinion **25** (sidewall **26**) but also straight portions **28** neighboring the deflection area **27**. The sidewalls **28** extend substantially parallel to the longitudinal center axis **29** of the drive pinion cover **18**.

As can be seen in FIGS. **2–5**, between the sidewall **26** and the sidewalls **28** connected thereto without a gap, the drive pinion cover **18** and the housing side **23** a cuttings chamber **30** is delimited that is open toward the guide bar **10**. For ejecting the wood cuttings produced during operation, the cover wall **38** opposite the housing wall **23**, in the vicinity of the deflection area **27** of the saw chain **10**, is provided with a cuttings ejection opening **40** which, as is shown in FIG. **3**, is substantially shaped as a circular segment with a radius about a center which is in the vicinity of the axis of rotation **35** of the drive pinion **25**. The cuttings ejection opening **40** extends in the circulating direction **31** of the drive pinion **25**, respectively, of the saw chain **11** from the longitudinal center axis **29** over an angle **32** of preferably 90°, especially approximately 135°. Because of this design of the cuttings ejection opening **40**, in the shown embodiment the drive pinion **25** is exposed within the cuttings ejection opening **40** about a circumferential angle of more than 90°.

The rim **33** of the cuttings ejection opening **40** is provided in the circulating direction **31** with a ramp **41** which in the shown embodiment is a unitary part of the cover **18** and is formed at the rim **33**. The ramp **41** can also be a separate component which is secured between the housing side **23** and the cover **18**. Also, the ramp **41** can be a unitary or integral part of the housing side **23** and then projects from the housing wall **23** into the cuttings ejection opening **40**. The ramp **41**, independent of its design, is spaced at a distance Z from the drive pinion **25**, extends then arch-shaped in the circulating direction **31** and projects from the plane of the cover wall **38** into the cuttings chamber **30**. For the purpose of removing the wood cuttings introduced into the cuttings chamber **30**, the ramp **41** at its forward end **42** extends onto the plane of the housing side **23**. The forward edge **43** of the forward end **42**, which extends substantially perpendicularly to the circulating direction **31**, preferably rests over a portion of its length at the housing wall **23** of the housing **9** that delimits the cuttings chamber **30**. Expediently, the inner longitudinal edge **44** rests in the circulating direction **31** over a great portion (most of its length), preferably over its entire length, at the housing wall **23** of the housing **9** that delimits the cutting chamber **30**. The ramp **41** with the housing wall **23** advantageously defines an obtuse angle **34** (FIG. **4**, FIG. **5**) opening toward the cuttings ejection opening **40**.

In the area of the rearward portion the ramp **41** is taken back by overcoming the spacing Z from the rim **33** to the drive pinion **25** whereby, as shown in FIG. **4**, the longitudinal edge **46** of the rearward portion **45** is positioned with minimal lateral spacing u to the saw chain **11**, respectively, the drive pinion **25**. Preferably, at least the ramp **41**, preferably also the cover **18** forming a unitary part with the ramp **41**, is made of plastic material so that the spacing u can be maintained at a minimal value. Should, because of great tolerance fluctuations, a covering of the saw chain occur, the saw chain upon first operation can cut the required free space at the ramp **41**. In this manner, a minimal spacing u is ensured.

The rearward portion **45** ends at the rim portion **47** extending substantially parallel to the longitudinal center axis **29** whereby the rim portion **47** itself if ramp-free. The ramp-free rim portion **47** connects the forward end **42** of the ramp **41** with the rear ward end **45**. The rim portion has a length slightly greater than the spacing Z.

During operation of the cutter head, the resulting wood cuttings are partially entrained by the saw chain **11** into the cuttings chamber **30** and are then released in the outgoing deflection area **27** from the saw chain i.e., in the area of the drive pinion **25**. These ejected wood cuttings oriented toward the ramp **41** are then guided outwardly along the ramp **41** to the cuttings ejection opening **40** so that they exit substantially at a slant laterally in the circulating direction **31** from the cuttings chamber **30** as is indicated by arrows **39** in FIG. **2**. In order to maintain the considerable movement component away from the cuttings chamber in the direction toward the cuttings ejection opening **40**, it may be expedient to embody the ramp **41** with increasing slant in a direction toward the rearward portion **45** in the circulating direction **31** or to design the geometry of the ramp **41** such that a desired and predetermined trajectory can be imparted to the emitted cuttings.

The drive pinion **25**, which is covered over a large portion of its circumference by the drive pinon cover **18**, is connected to the end **36** of the drive shaft **37** so as to rotate therewith, whereby the drive shaft **37** substantially extends at a right angle to the housing wall **23**.

The specification incorporates by reference the disclosure of German priority document 197 53 360.4 of Dec. 2, 1997. The present invention is, of course, in no way restricted to the specific disclosure of the specification and drawings, but also encompasses any modifications within the scope of the appended claims.

What is claimed is:

1. A cutter head for a motor chainsaw, said cutter head comprising:

a cutter head housing **(9)**;

a drive shaft **(37)** mounted in and projecting from said cutter head housing **(9)**;

a drive pinion **(25)** mounted on a portion of said drive shaft **(37)** projecting from said cutter head housing **(9)**;

a guide bar **(10)** having a first deflecting end positioned adjacent to said drive pinion **(25)**;

a saw chain **(11)** driven by said drive pinion **(25)** and circulating in a circulating direction on said guide bar **(10)**;

said saw chain **(11)** being deflected by said first deflecting end;

said cutter head housing **(9)** having an exterior housing wall **(23)**;

a cover **(18)** connected to said exterior housing wall **(23)** of said cutter head housing **(9)**;

said cover **(18)** and said housing wall **(23)** enclosing a cuttings chamber **(3)** open toward said guide bar **(10)**;

said drive pinion **(25)** positioned in said cuttings chamber **(3)**;

said first end of said guide bar **(10)** clamped between said housing wall **(23)** of said cutter head housing **(9)** and said cover **(18)**;

wherein said cover **(18)** has a cuttings ejection opening **(40)** opposite said housing wall **(23)** in the vicinity of said first end of said guide bar in an area where said saw chain is deflected in a direction of exiting said cuttings chamber **(3)** in said circulating direction;

wherein said cuttings ejection opening (**40**) has a rim (**33**, **47**) with a first rim portion (**33**), said first rim portion (**33**) having a curvature configured to match a curvature of said first deflecting end); and

wherein said cuttings ejection opening (**40**) has a ramp (**41**) extending from said first rim portion (**33**) into said cuttings chamber (**30**).

2. A cutter head according to claim **1**, wherein said ramp (**41**) is connected directly to said first portion of said rim (**33**).

3. A cutter head according to claim **1**, wherein said ramp (**41**) has a rearward end (**45**) in said circulating direction (**31**) and wherein said rearward end (**45**) has an increasing slant angle.

4. A cuter head according to claim **3**, wherein said rearward end (**45**) extends from said rim (**33**) toward said drive pinion (**25**).

5. A cutter head according to claim **3**, wherein said rearward end (**45**) of said ramp (**41**) has an edge (**46**) positioned closely to said saw chain (**11**) and to said drive pinion (**25**).

6. A cutter head according to claim **1**, wherein said ramp (**41**) is a part of said cover (**18**) and has an edge (**44**) opposite said rim (**33**), wherein said edge (**44**) rests at said housing wall (**23**) over most of a length of said rim (**44**).

7. A cutter head according to claim **1**, wherein said ramp (**41**) and said housing wall (**23**) define an obtuse ejection angle (**34**) in a direction toward said cuttings ejection opening (**40**).

8. A cutter head according to claim **1**, wherein said rim has a second portion (**47**) extending parallel to a longitudinal center axis (**29**) of said cover (**18**) and wherein said second portion (**47**) is ramp-free.

9. A cutter head according to claim **1**, wherein said cover (**18**) has a first sidewall (**26**) in said area of outgoing deflection of said saw chain (**11**) and a neighboring straight sidewall (**28**), wherein said cover (**18**) rests at said housing wall (**23**) over an entire extension of said first sidewall (**26**) and said neighboring straight sidewall (**28**).

10. A cutter head according to claim **1**, wherein said cuttings ejection opening (**40**) begins at a longitudinal center axis (**29**) of said cover (**18**) and extends over an angle of at least 90° in the circulating direction (**31**) of said chain saw (**11**).

11. A cutter head according to claim **10**, wherein said angle is 135°.

12. A cutter head according to claim **1**, wherein said cutting ejection opening (**40**) in a plan view is a circular arc segment having a center of origin in the vicinity of an axis of rotation of said drive pinion (**25**).

13. A cutter head according to claim **1**, wherein said drive pinion (**25**) is exposed in said cutting ejection opening (**40**) over a circumferential angle of more than 90°.

14. A cutter head according to claim **1**, wherein said ramp (**41**) is an integral part of said cover (**18**).

15. A cutter head according to claim **14**, wherein said cover (**18**) with said ramp (**41**) consists of plastic material.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO : 6,112,419
DATED : September 5, 2000
INVENTOR(S): Klaus-Martin Uhl, Joachim Hoffmann,
Berthold Schell, and Karl-Otto Stimpfig

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown be'ow:

On the Title Page, the following item should read as follows:

[75] Inventors:

Klaus-Martin Uhl, Joachim Hoffmann,
Berthold Schell, and Karl-Otto Stimpfig

Signed and Sealed this

Fifteenth Day of May, 2001

Attest:

Nicholas P. Godici

NICHOLAS P. GODICI

Attesting Officer

Acting Director of the United States Patent and Trademark Office